

(12) **United States Patent**  
Pinkus et al.

(10) Patent No.: **US 6,401,589 B1**  
(45) Date of Patent: **\*Jun. 11, 2002**

(54) **LIMITING AIRBORNE TARGET  
DESIGNATING LASER CANOPY RETURNS**

(75) Inventors: **Alan R. Pinkus**, Bellbrook; **Harry L. Task**, Dayton; **Peter L. Marasco**, Kettering, all of OH (US)

(73) Assignee: **The United States of America as represented by the Secretary of the Air Force**, Washington, DC (US)

(\*) Notice: This patent issued on a continued prosecution application filed under 37 CFR 1.53(d), and is subject to the twenty year patent term provisions of 35 U.S.C. 154(a)(2).

Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/501,290**

(22) Filed: **Feb. 9, 2000**

(51) Int. Cl.<sup>7</sup> ..... **F41F 5/00**

(52) U.S. Cl. .... **89/1.1**

(58) Field of Search ..... **244/129.3; 89/1.11**

(56) **References Cited**

**U.S. PATENT DOCUMENTS**

3,618,881 A	• 11/1971	Fellers et al.	244/121
4,618,224 A	• 10/1986	Smith	359/841
4,677,288 A	• 6/1987	Smith	250/216
4,749,261 A	• 6/1988	McLaughlin et al.	
H979 H	• 11/1991	Kelley	244/129.3
5,276,693 A	• 1/1994	Long et al.	
5,657,161 A	• 8/1997	Melograne	359/501
5,729,010 A	• 3/1998	Pinkus et al.	
5,739,950 A	• 4/1998	Wood et al.	
5,747,792 A	• 5/1998	Kintz et al.	
5,751,380 A	• 5/1998	Hanssen	
5,756,989 A	• 5/1998	Bear et al.	

5,790,209 A	• 8/1998	Engelhardt et al.	
5,793,450 A	• 8/1998	Engelhardt et al.	
5,828,437 A	• 10/1998	Hubert-Harbart et al.	
6,028,724 A	• 2/2000	Leib	359/886
6,042,239 A	• 3/2000	Liepmann et al.	359/601

\* cited by examiner

*Primary Examiner*—Charles T. Jordan  
*Assistant Examiner*—Jordan M. Lofdahl

(74) *Attorney, Agent, or Firm*—Gerald B. Hollins; Thomas L. Kundert

(57) **ABSTRACT**

A laser energy window arrangement especially usable in a tactical aircraft having night vision equipment-aided cockpit visual information input requirements. The laser energy window arrangement enables use of laser apparatus directed external to the aircraft for target designation or other purposes while minimizing the amount of energy from such laser returning spuriously inside the cockpit where it inherently acts a noise signal for night vision equipment. The laser energy window limits the portion of the aircraft windshield or canopy exposed to laser radiation and its effects to a relatively small area, an obscurable area generating significantly reduced amounts of spurious return energy in comparison with use of the laser directly through an unlimited windshield, canopy, or other type of transparency. Transmission of spurious return energy from the laser energy window to remaining portions of the windshield or canopy is precluded by interruption of transmission paths within the windshield or canopy material and transducing the interrupted path energy into heat dissipated within or outside of the aircraft and not affecting the remainder of the canopy. Potentially increased aircraft to target standoff range, reduce need for aircrew use of laser eye protection gear, reduced laser induced windshield or canopy degradation and other benefits are identified for aircraft uses of the invention. Use of the window invention in other non aircraft and non military aircraft settings is also contemplated.

**15 Claims, 5 Drawing Sheets**

